



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/382,524	08/25/1999	PAUL A. FARRAR	303.610US1	5340

21186 7590 10/23/2006

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.  
P.O. BOX 2938  
MINNEAPOLIS, MN 55402

EXAMINER

PERT, EVAN T

ART UNIT PAPER NUMBER

2826

DATE MAILED: 10/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/382,524

Applicant(s)

FARRAR, PAUL A.

Examiner

Evan Pert

Art Unit

2826

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9, 11-21, 24 and 25 is/are rejected.
- 7) ☒ Claim(s) 10, 22 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 August 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 0806.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Wycliffe (US 4,988,581).

The Wycliffe reference discloses a conductive system (i.e. a battery system) comprising: a substrate (i.e. anode 10 shown in Fig. 5, acts as a substrate for supporting additional elements); a foamed material layer on the substrate (i.e. non-conducting foam layer 13) the foamed material layer having a surface that is hydrophobic (per col. 4, line 51); and a plurality of conductive structures embedded in the foamed material layer (i.e. electrical connectors 17 for connecting anode to cathode are "embedded" in layer 13, since the electrical connectors 17 pass through layer 13 and are tightly surrounded by layer 13).

3. Claims 1-3, 6-7, 11-14, 17, 21, and 25 are rejected under 35 U.S.C. 102(e) as being anticipated by Rutherford et al. (US 6,318,124).

Regarding claims 1, 2, 3, the '124 reference discloses a conductive system (i.e. interconnects for semiconductor devices) comprising: a substrate (col. 7, lines 5-27); a foamed material layer on the substrate (i.e. "nanoporous silica" which is a "foamed" material per col. 2, lines 26-29), the foamed material layer having a surface that is hydrophobic (col. 2, line 65); and a plurality of conductive structures embedded in the foamed material layer (i.e. interconnect lines per col. 7, lines 15-22).

Regarding claim 2, the thickness of the foamed layer (i.e. the nanoporous silica layer) is preferably "0.1 to 3 microns" [col. 5, line 3].

Regarding claim 3, the dielectric constant is "preferably less than 3" and is preferably about "1.5 to 2.5" [col. 4, lines 61-67].

Regarding claims 6, 7 and 11, the cell size is less than 1 micron [see col. 7, lines 23-27].

Regarding claim 7, the conductive structures embedded are conductive circuit lines [col. 7, lines 22-23].

Regarding claim 11, the cell size is as small as "0.05 microns" per col. 7, line 26.

Regarding claim 12, the lines are advantageously copper [col. 7, line 21].

Regarding claim 13, the lines are advantageously aluminum [col. 7, line 21].

Regarding claim 14, the substrate is a semiconductor substrate [col. 7, line 12].

Regarding claim 17, the substrate is advantageously epitaxial silicon [col. 7, lines 14-15].

Regarding claims 21 and 25, the substrate is advantageously GaAs [col. 7, lines 12-13].

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4, 5, 15, 16, 18-20 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rutherford et al. as applied to claims 1, 2, 3, 7 and 11 above, and further in view of Buchwalter et al. (US 6,577,011).

The Rutherford et al. is silent about "foamed polymer" and "aerogel" as Inter-level dielectric material.

Regarding claims 4, 5, 15, 16, 18-20 and 24, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to adopt "aerogel" or "foamed polyimide" as an alternative to the nanoporous silica disclosed in the Rutherford et al. reference, motivated to provide a low dielectric constant from a porosity that can be treated to be hydrophobic, as taught by the Ruetherford et al. reference.

Regarding claim 15, the Rutherford et al. reference is silent about the substrate comprising "doped semiconductor" yet it would have been obvious at the time of the claimed invention to one of ordinary skill in the art to include doped semiconductor, for making functional devices [see MPEP 2144].

Regarding claim 16, the Rutherford et al. reference is silent about the substrate comprising "undoped semiconductor" yet it would have been obvious at the time of the claimed invention to one of ordinary skill in the art to include undoped semiconductor, for making functional devices such as undoped intermediate regions or channel regions [see MPEP 2144].

Regarding claims 20 and 24, the Rutherford et al. reference is silent about the substrate comprising "germanium" yet it would have been obvious at the time of the claimed invention to one of ordinary skill in the art to include germanium, for making functional devices since Ge is a well known semiconductor with a smaller band-gap than silicon suitable for making switching semiconductor devices, for example [see MPEP 2144].

#### ***Allowable Subject Matter***

6. Claims 10, 22 and 23 are allowed.
7. The following is a statement of reasons for the indication of allowable subject matter. The prior art does not disclose a "foamed material layer" on a substrate with a "surface that is hydrophobic" and having "a plurality of conductive structures embedded" therein, the foamed material layer being a "foamed polymer containing silane".

#### ***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on 571-272-1915. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ETP  
October 16, 2006

  
**EVAN PERT**  
**PRIMARY EXAMINER**